Chapter 4

Problem set 2 (Molarity, Gravimetric and Volumetric Analysis)

Answer keys

1. Heme, obtained from the red blood cells, binds oxygen. How many moles of heme are there in 75 mL of 0.0019 M heme solution?

Answer: 1.44 x 10-4 mol

1. You wish to prepare 0.16 M HNO3 from a stock solution of nitric acid that is 15.8 M. How many millimeters of the stock solution do you require to make up 1.00 L of 0.16 M HNO3?

Answer: 9.9 mL

1. A compound of iron and chloride is soluble in water. An excess of silver nitrate was added to precipitate the chloride ion as silver chloride. If a 134.8-mg sample of the compound gave 304.8 mg AgCl, what is the formula of the compound?

Answer: FeCl2

1. What volume of 0.250 M HNO3 (nitric acid) reacts with 44.8 mL of 0.150 M Na2CO3 (sodium carbonate) in the following reaction?

2HNO3(aq) + Na2CO3(aq) → 2NaNO3(aq) + H2O(l) + CO2(g)

Answer: 50.9 mL nitric acid

1. A solution of hydrogen peroxide, H2O2, is titrated with a solution of potassium permanganate, KMnO4. The reaction is

5H2O2(aq) + 2KMnO4(aq) + 3H2SO4(aq) → 5O2(g) + 2MnSO4(aq) + K2SO4(aq) + 8H2O(l)

It requires 51.7 mL of 0.145 KMnO4 to titrate 20.0 g of the solution of hydrogen peroxide. What is the mass percentage of H2O2 in the solution?

Answer: 3.19 %

1. A l0.0-mL sample of potassium iodide solution was analyzed by adding an excess of silver nitrate solution to produce silver iodide crystals, which were filtered from the solution.

KI(aq) + AgNO3(aq) 🡪 KNO3(aq) + AgI(s)

If 2.290 g of silver iodide was obtained, what was the molarity of the original KI solution?

Answer: 0.930 mol/L

1. Determine the volume of sulfuric acid solution needed to prepare 37.4 g of aluminum sulfate, Al2(SO4)3, by the reaction

2Al(s) + 3H2SO4(aq)🡪 Al2(SO4)3(aq) + 3H2(g)

The sulfuric acid solution, whose density is 1.104 g/mL, contains 15.0% H2SO4 by mass.

Answer: 0.194 L